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Marshall Space Flight Center



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Reproductive Cell Separation: A Concept

Selective breeding of animals to obtain certain desirable traits in their offspring is based on probability. The breeder must study hereditary history of the two animals that are to be mated to predict what type of offspring will be born. If the chances are high that a desirable type of offspring will be born, he will allow the two animals to mate; if the chances are low, he may select a better mate for one of his animals or match another pair. In either case, the breeder is confronted with different degrees of uncertainty and so chooses the less risky alternative.

To date, geneticists have achieved complete control in the breeding of lower forms of life. Frogs, for example, have been bred by artificially implanting a single cell nucleus from any tissue of a donor frog into a mature frog egg. The offspring born this way are the exact genetic duplicate of the donor frog. With mammals, however, this approach still involves too many complexities to be put into practical use.

One step in this direction has been an attempt to separate the mammalian male (Y) bearing sperm from the female (X) bearing sperm. Research has shown that the male-bearing sperm is lighter and more motile than the female-bearing sperm and therefore stands a better chance of fertilizing the female egg. Statistics support this observation by indicating a rate of birth of 106 males to 100 females. Both types of sperm are very dependent on gravity for their direction of movement.

Attempts to separate the sperm by sedimentation and centrifugation have been largely unsuccessful. Some success has been obtained through electrophoresis; however, the sperm separated this way lose viability.

The proposed concept suggests the electrophoretic separation under zero gravity. It is hypothesized that under zero gravity, spermatozoa become disoriented. In this case, imposition of an electrophoretic force of suitable magnitude and direction may be a more effective means of separating the X and Y sperm.

Should this attempt be successful, the breeder will then be able to control the sex of his offspring. Long-range consequences of this process may involve separation of sperm into other categories to prevent defective births.

Note:

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Marshall Space Flight Center
Code A&PS-TU
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